CANADA/NOVA SCOTIA ACID RAIN REDUCTION AGREEMENT

Nova Scotia Department of the Environment
Report on Year Ending March 31, 1988
Honourable John G. Leefe, Minister

The federal Minister of Environment and the Ministers of Environment of Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia and Newfoundland are committed, using least cost options, to achieving a wet sulphate deposition of no more than 20 kilograms per hectare per year to protect the environment in moderately sensitive areas in eastern Canada by reducing total sulphur dioxide emissions east of the Saskatchewan/Manitoba border and by securing compatible emission reductions in the United States as soon as possible.

Montreal 05.02.85

CANADA/NEWFOUNDLAND AGREEMENT RESPECTING A SULPHUR DIOXIDE REDUCTION PROGRAM

This agreement made on 9 March 1987.

CANADA/NOVA SCOTIA AGREEMENT RESPECTING AN ACID RAIN REDUCTION PROGRAM

This agreement made on 12 February 1988.

CANADA/PRINCE EDWARD ISLAND AGREEMENT RESPECTING A SULPHUR DIOXIDE REDUCTION PROGRAM

This agreement made on 9 March 1987.

CANADA/NEW BRUNSWICK AGREEMENT RESPECTING A SULPHUR DIOXIDE REDUCTION PROGRAM

This agreement made on 8 October 1987.

CANADA/QUEBEC AGREEMENT RESPECTING THE REDUCTION OF ACID PRECIPITATION

This agreement made on 20 March 1987.

CANADA/ONTARIO AGREEMENT RESPECTING A SULPHUR DIOXIDE REDUCTION PROGRAM

This agreement made on 10 March 1987.

CANADA/MANITOBA AGREEMENT RESPECTING A SULPHUR DIOXIDE REDUCTION PROGRAM

This agreement made on 10 April 1987.

Canada/Nova Scotia Acid Rain Reduction Agreement
Annual Report of the Nova Scotia Department of the Environment

Introduction

The previous page shows that during an eleven month period between March 1987 and February 1988, the seven eastern-most Canadian provinces formalized Acid Rain Agreements with the government of Canada.

The Agreements were based on verbal commitments of Canadian environment ministers which were made in Montreal on February 5, 1985. The ministers shared a widespread concern that acid rain was damaging the environment of Canada. They agreed that a phased program of emissions reductions for sulphur dioxide (SO_2), the main cause of acid rain, should be implemented over a 10 year period. Large point-sources like the non-ferrous smelters would be individually addressed during initial stages of the program while smaller area or diffuse sources would be collectively considered shortly thereafter. Air pollution control programs have been developed in the country on a schedule similar to this.

Ministers also agreed that in order to maximize environmental benefits at least cost, sites for SO_2 reductions should be carefully selected. At the time the cost of the control programs for the seven provinces was estimated to be $640 million for each year of a 20 year amortization schedule. Optimal locations for SO_2 reductions were therefore guided by the output of a

computer model which linked sources and receptors of air pollution and coupled that information with costs of abatement technologies. We expect this process to continue to guide air pollution control programs in Canada.

The following report is presented as the first of a series of annual reports scheduled to be produced each spring by the Nova Scotia Department of the Environment. The series will provide details on Nova Scotia's involvement in the acid rain reduction program of eastern Canada. This first annual report is designed to provide some information on the Canada-Nova Scotia Acid Rain Agreement of February 12, 1988.

The Department expresses its sincere gratitude to the efforts of several individuals who have assisted in the collection of rain samples over the past ten years. It is only through their efforts that a field monitoring program can be maintained. Miles Russell of New Ross and the family of Clayton Hattie of East River St. Marys have maintained samplers since 1978. We thank the Provincial Department of Education for permitting Mr. Russell to operate the sampler at Ross Farm museum. We thank also the Department of Fisheries and Oceans for their assistance at the Lake George Hatchery and the Collingwood Hatchery. Mr. Wilfred Austin, Mr. Vernon Lloy and Mr. Spurgeon Lloy of the Collingwood Hatchery have operated that sampler for over 10 years now. Mr. Doug Aitkens and Mr. Eldon Young have kindly provided assistance at the Lake George (Yarmouth) Hatchery. Parks Canada have been willing participants in the program also. Wardens from Cape Breton Highlands National Park have

maintained the Cape North sampler since 1980 and we thank in particular Mr. Murray Peterson and Mr. Randy Thompson.

There are others who have offered their assistance at existing or now dismantled precipitation stations. We extend sincere gratitude for their efforts as well, and we apologize for failing to mention their efforts individually.

1. The Acid Rain Agreement

"... this Agreement represents a significant step in what I see as a very much more determined effort by all levels of government in Canada to deal with these harmful emissions [of sulphur dioxide] which poison our lakes and streams..." So said Nova Scotia's Environment Minister of the day, Honourable Roland J. Thornhill, on the occasion of the February 12, 1988 signing of the Acid Rain Agreement with federal Environment Minister Tom McMillan.

Honourable John G. Leefe, the current Environment Minister for the province, offered that "The Agreement provides a focus for many acid rain issues. It is our intention to participate fully in this eastern Canadian initiative to provide cost-effective relief to environments of this country which are damaged by acid rain."

The Acid Rain Agreement is a blend of obligations and initiatives on the part of both the federal and the provincial governments. For its part, the federal government has agreed to support nine initiatives or programs. Included in these are obligations to:

1. obtain an acid rain accord with the United States;
2. support new technologies for cleaning or combustion of Nova Scotia coal;
3. continue research on acid rain models, monitoring, and impacts; and
4. investigate opportunities for fuel switching for heavy fuel oil users in order to reduce SO_2 emissions.

When asked to comment on the role of Nova Scotia Environment in addressing obligations of the Agreement, Deputy Environment Minister Armand Pinard stated that "the Department will implement a coordinated program with six initial objectives in mind. It is our intention to:

1. continue to monitor and report emissions and/or ambient levels of sulphur dioxide (SO_2) in the provinceon a regular basis;
2. continue to monitor and report deposition of acid rain in the province;
3. review current regulations or guidelines for SO_2 emitters in the province, including their emissions monitoring programs;
4. continue to cooperate in studies designed to investigate impacts of acid rain on the environment;

5. continue to work with other provinces and states to implement regional acid rain programs; and

6. prepare information kits for public distribution."

In concert with this policy, Mr. Pinard has appointed Dr. John Underwood as the Acid Rain Coordinator for the Department. Dr. Underwood was a participant in the negotiations that led to the development of the Agreement. He has also operated the province's acid deposition monitoring program for the past twelve years. He will now assemble the components required to honour the commitments made by the province in the Acid Rain Agreement. The full agreement is appended to this report.

2. The SO_2 Emissions Program

2a An SO_2 Inventory

In 1986, Environment Canada published a summary of their best estimates for 1980 emissions of SO_2 in Canada. In 1987 they gathered information for a 1985 inventory. Its projected date of release is 1989 or 1990. In so far as the Acid Rain Agreement calls for an annual inventory of SO_2 emissions, the existing system is inadequate to address this need. It is therefore the objective of N.S.D.O.E. to work with the Environment Canada and Industry in order to produce an annual inventory of SO_2 emissions in the province. For some sectors of the economy, this will be an easy task.

The Nova Scotia Power Corporation monitors the quality of the oil and coal burned in its thermal stations and determination of annual air emissions is relatively straight-forward. Estimation of emissions from myriad smaller sources is more difficult. Heating fuels for industrial, commerical, and residential establishments produce approximately 15% of annual SO_2 emissions in the province. These fuels are supplied by a variety of wholesale and retail operations throughout Nova Scotia, and the collected air contaminants are released from several hundred thousand flues. Substantial effort will be required to inventory such sources. Nova Scotia Department of the Environment has assigned the task of compiling this inventory to professional staff who will complement the team-effort required to respond to the Acid Rain Agreement.

2b Emissions of SO_2 in Nova Scotia

Sulphur is one of a number of elements which form gases when they are heated in air. The most common of these elements is probably carbon and a change in mass and structure from black charcoal briquets to particles of grey ash, a phenomenon readily recognized by barbequers. What may be unclear is that the black carbon was transformed to colorless carbon monoxide or dioxide gas in a process that also, and perhaps more noticeably, seared a steak or two.

Sulphur is a frequent impurity in metallic ores and fuels like coal and oil. One form of solid mineral sulphur in coal is iron pyrites or fool's

gold. High temperature combustion of coal leads to conversion of solid to gaseous forms of sulphur, the most prevalent of the latter being sulphur dioxide. Thus while exhaust gases from a coal fire will consist primarily of CO_2, minor quantities of other gases like SO_2 will also be present.

In 1980 about 2 million tonnes of coal and 30 million barrels of petroleum products were burned in Nova Scotia. Emissions of SO_2 from the combustion of these fuels in the 1980 base case adopted by Canadian environment ministers was 219,000 tonnes. The 1988 agreement demands a maximum 1994 emission's objective is 204,000 tonnes. This number is based in part on a September 1987 ministerial order that emissions from the Nova Scotia Power Corporation will not exceed 160,000 tonnes and that estimated emissions from the pulp and paper industry and the oil industry would each total up to 10-12,000 tonnes in 1994. In support of these latter estimates, it is noted that SO_2 emissions from wood pulping processes have changed little since 1980. Significant reductions have resulted however, from firing power boilers on bark and wood refuse rather than heavy fuel oil.

The two oil refineries have similarly indicated that major production changes are unlikely over the next several years. The larger of the two, Esso Petroleum Canada, operates a Claus System for sulphur recovery, and excellent operating efficiency has been reported.

An ambient air quality monitoring program in Nova Scotia provides data to permit comparisons of results in the province with the National Ambient Air Quality Objectives. The objective is to determine if the atmospheric quality

in Nova Scotia remains at a level which is conducive to good health and a high quality environment. Sulphur dioxide monitors are operated in four areas of the province, industrial Cape Breton, Port Hawkesbury, Pictou and Halifax-Dartmouth. Historically almost all readings recorded have been within the acceptable range, with the vast majority of readings recorded being in the desirable range of the National Ambient Air Quality Objectives. As well as operating its own monitors, the Department cooperates in programs with the federal government and industry. For example, both the Nova Scotia Power Corporation and Imperial Oil Limited operate ambient air monitoring networks and provide the information to the Department so that better regional perspectives may be developed.

2c Air Pollution Regulations

Pollution in Nova Scotia is regulated by the Environmental Protection Act. Section 23(1) of the Act specifies that:

> No person shall own, occupy, operate or be responsible for the operation of a plant, structure, facility, undertaking or thing that discharges, releases, deposits, drains, emits or threatens or allows the discharge, release, deposit or drainage or emission of waste into the environment or otherwise causes or tends to cause pollution unless he has obtained a permit from the Minister.

Permits to operate businesses/industries in Nova Scotia are individually assigned by the provincial environment Minister. These industrial waste permits have stipulations on sulphur emissions where this is considered apropriate. Where air quality is of concern, the federal guidelines are applied. The federal legislation stipulates that impairment or danger of impairment of public health in Canada or foreign countries by air pollution is prohibited by the Clean Air Act. This Act contains a number of Ambient Air Quality Objectives which cover hourly, daily and annual limits for SO_2 and several other contaminants.

During the coming months, sources in Nova Scotia which emit or have a potential to emit SO_2 will be reviewed to determine whether their permits adequately address air pollution concerns. At present the consensus is that, only sources which may release over 100 tonnes SO_2 per annum will be reviewed. Where appropriate, Section 25 of the Environmental Protection Act will be applied. This clause gives the Minister authority to order a person or company discharging waste into the environment to monitor or measure the discharge.

2d SO_2 Emissions - The Next Steps

The first stages of Nova Scotia's formal participation in the Acid Rain Agreement will largely be devoted to reviewing the status of the current situation. It is probable that the emissions monitoring program(s) in the province will require supplementation. Discussions with several industries will continue in order to review their roles in the Acid Rain Agreement.

Discussions with both Nova Scotia Power Corporation and the coal and petroleum industries have produced some guidance on prospects for the future. Nova Scotia Power Corporation has implemented a system-wide inventory process that will yield monthly summaries of air quality emissions. They have purchased air and precipitation quality measurement and/or collection systems to supplement their existing systems. They will also begin to evaluate atmospheric transport of their emissions and incorporate these data as appropriate into reports to be submitted to the Department each January, beginning in 1990. Commissioning of their next coal-fired generating unit at Trenton will result in a system - wide reduction in SO_2 emissions. Planning for a subsequent unit (in Cape Breton) will incorporate a recognition of concerns about uncontrolled sulphur emissions. Fluidized bed combustion is the option being carefully evaluated for that site. Consideration of the principles of best practicable pollution abatement technology will be required in all future environmental impact statements prepared by N.S.P.C.

The coal industry has participated in a number of studies to enhance the quality of this fuel. High sulphur coal from Nova Scotia will be tested in Chatham, New Brunswick for its reactions in circulating fluid bed combustion. Similar coals will form part of a test sequence at a limestone injection multistage burner being installed by Ontario Hydro. Processes which range from advanced cleaning to production of coal/liquid fuels (to replace oil) have been examined. Emerging technologies like coal gasification are being scrutinized.

These latter programs offer a potential for SO_2 reductions in myriad small industrial/commercial/residential establishments, some of which presently use high sulphur, heavy-grade fuel oils in their boilers.

3. Acid Rain and the Environment of Nova Scotia

The Acid Rain Agreement is premised on the hypothesis that when sulphate deposited with precipitation exceeds 20 kilograms per hectare (kg/ha) in any year, damage to moderately sensitive aquatic environments may occur. The working definition for moderately sensitive specifies that such fresh waters will contain up to 200 microequivalents per litre (4 milligrams per litre) of alkalinity or acid neutralizing capacity. Waters with pH of perhaps 7.2 would contain this much acid neutralizing capacity.

A second category of lakes has subsequently been recognized for its extreme sensitivity to acid deposition. Lakes which are less alkaline than about pH 6.6 (1 mg/L acid neutralizing capacity) are of concern when wet sulphate deposition reaches perhaps 15 kg/ha. This deposition value is admittedly an interim guideline and several research efforts in North America are focussed on refinement of a "critical loading limit" for sulphate in lakes. Lakes with pH below 5.5 have no ability to neutralize acidity.

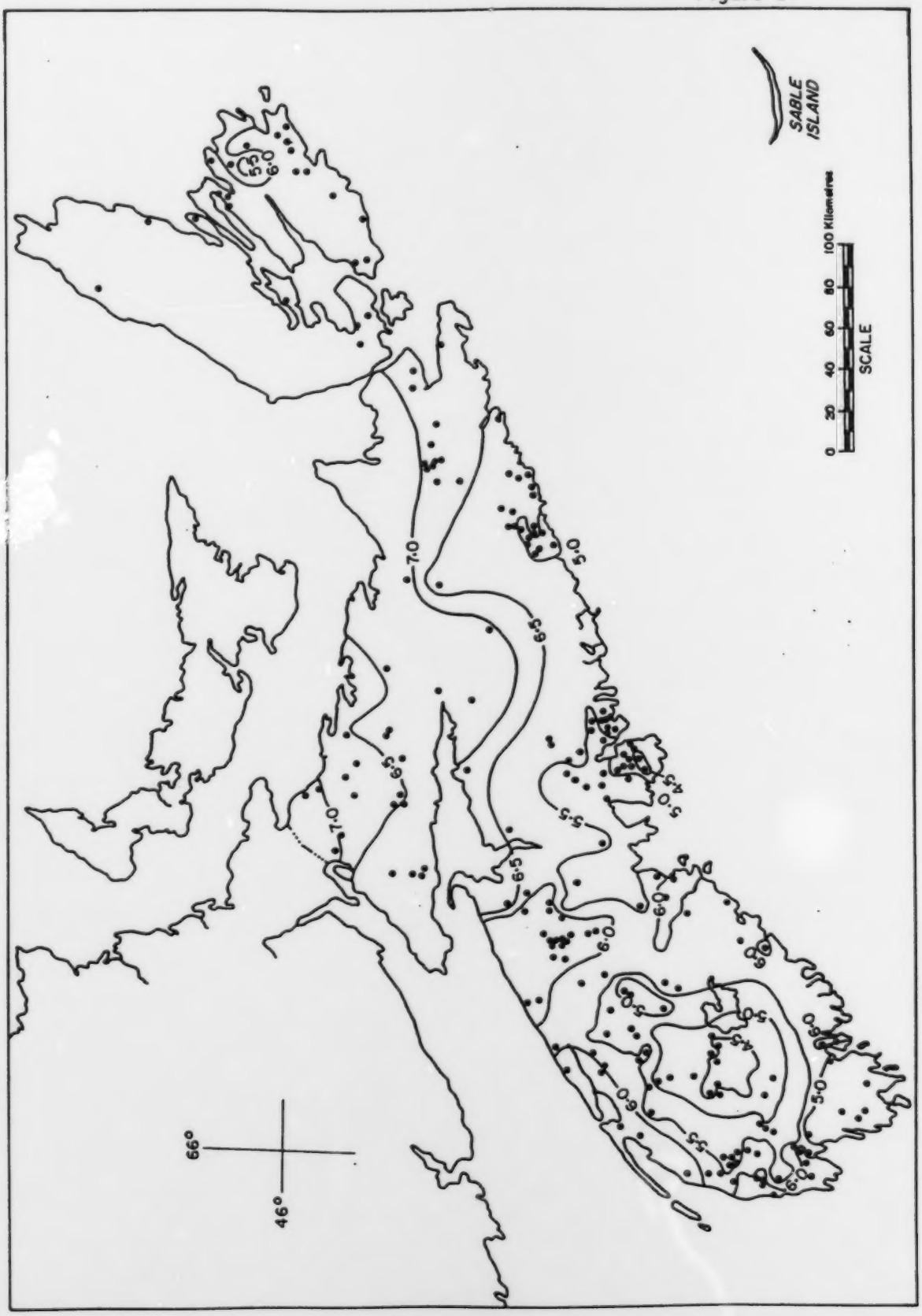
Nova Scotia contains 6,674 lakes larger than 1 ha in area. The total fresh water surface area of the lakes is 2,255 km^2. We believe that 69% of

the lakes, which represent 80% of the surface area, are in an extremely sensitive category. Furthermore, 16% of the lakes (26% of lake area) have no ability to neutralize acids. Figure 1 demonstrates that the interior of southwestern Nova Scotia is where the largest number of sensitive lakes are to be found.

Federal scientists from both Environment Canada and Fisheries and Oceans (DFO) have also studied lakes and rivers in Nova Scotia. One summary DFO paper provides evidence that of 60 rivers flowing into the Atlantic along the southern and eastern shores of the province; 44 have pH less than 5.5.

The Nova Scotia Department of the Environment will continue to support acid rain research efforts. A deposition network of precipitation collectors will be maintained on a weekly schedule. An average of about 18 kg SO_4/ha falls on the province in a decreasing trend from southwest to northeast. Acid levels maintain an average pH of about 4.7. Figure 2 shows the pattern of deposition of sulphate and nitrate across the province in 1980. Current NSDOE precipitation stations are shown as squares. Other stations, both past and existing are also shown on this Figure which illustrates a decreasing gradient in deposition along a southwest to northeast axis. Most SO_4 deposition in the study data set occurred when winds blew from the southwest. Urban influences are shown to add significantly to the background gradient. Since 1980, annual deposition of SO_4 appears to have decreased very slightly.

Figure 1


SABLE ISLAND
0 20 40 60 80 100 Kilometres
SCALE
66°
46°
7.0
6.5
6.0
5.5
5.0
4.5

Impacts of acid rain on watersheds will continue to be investigated through collaborative studies with other governments and universities. One such effort initiated in the spring of 1988 is a two year program combining the talents of the centre for Water Resources Studies at the Technical University of Nova Scotia, the Universty of Minnesota, Dalhousie University, Environment Canada (Lands Directorate and Inland Waters Directorate) and Nova Scotia Department of the Environment. The focus of this study concerns watershed sources for organic and mineral acids in small catchments. Results are anticipated in March of 1990.

Other efforts in which this department has participated include a variety of chemical and biological studies which are available through scientific journals. The titles of these are shown in Appendix 2.

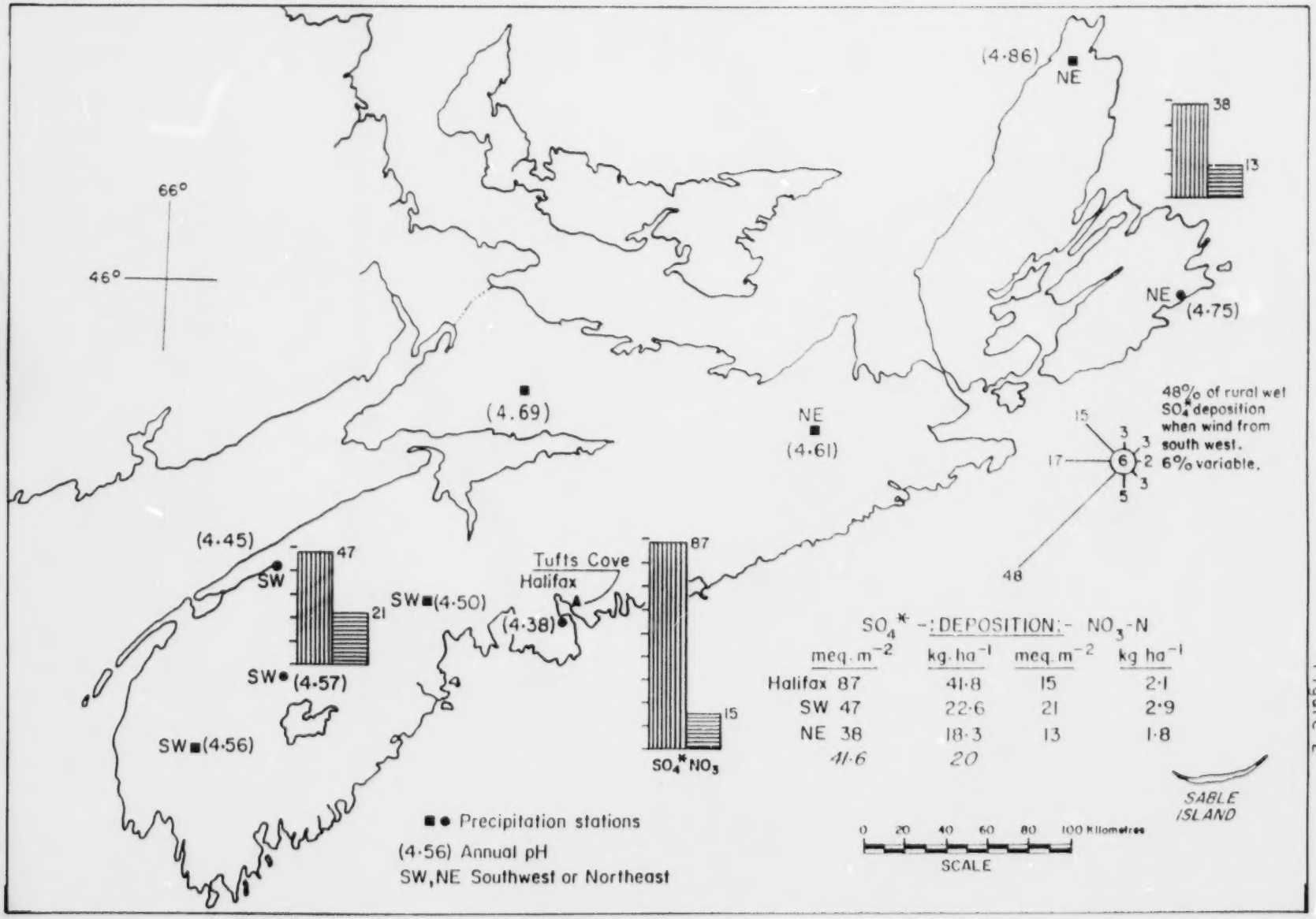

66°
46°
(4·86)
NE
38
13
NE
(4·75)
(4.69)
NE
(4·61)
48% of rural wet SO4 deposition when wind from south west.
6% variable.
15
3
3
17
6
2
3
5
48
(4·45)
47
SW
21
SW■(4·50)
Tufts Cove
Halifax
(4·38)
87
15
SO4* NO3
SW● (4·57)
SW■(4·56)
SO4* -: DEPOSITION :- NO3-N
meq.m-2 kg.ha-1 meq.m-2 kg ha-1
Halifax 87 41·8 15 2·1
SW 47 22·6 21 2·9
NE 38 18·3 13 1·8
41·6 20
SABLE ISLAND
■● Precipitation stations
(4·56) Annual pH
SW, NE Southwest or Northeast
0 20 40 60 80 100 Kilometres
SCALE

Figure 2

Appendix 1

The Canada/Nova Scotia Agreement

Respecting an Acid Rain Reduction Program.

ENTENTE ENTRE LE CANADA ET
LA NOUVELLE-ÉCOSSE CONCERNANT
UN PROGRAMME DE RÉDUCTION
DES PLUIES ACIDES

CANADA/NOVA SCOTIA AGREEMENT
RESPECTING AN ACID RAIN
REDUCTION PROGRAM

ENTENTE ENTRE LE CANADA ET LA NOUVELLE-ÉCOSSE CONCERNANT UN PROGRAMME DE RÉDUCTION DES PLUIES ACIDES

Conclue le 12 février 1988.

Entre : LE GOUVERNEMENT DU CANADA (appelé ci-après " Canada ") représenté par le ministre de l'Environnement

ET

LE GOUVERNEMENT DE LA NOUVELLE-ÉCOSSE (appelé ci-après " province ") représenté par le ministre de l'Environnement.

Attendu que le Canada et la Nouvelle-Écosse souhaitent élaborer et appliquer de concert des mesures afin de réduire les émissions de dioxyde de soufre en Nouvelle-Écosse, conformément à l'entente conclue le 5 février 1985, à Montréal, par les ministres fédéral et provinciaux de l'Environnement, concernant la répartition par province de la réduction des émissions de dioxyde de soufre pour abaisser le dépôt acide dans l'est du Canada;

Attendu que le Canada et la Nouvelle-Écosse conviennent des objectifs, de la stratégie générale et des modalités en ce qui concerne cette réduction;

En conséquence, les parties conviennent de ce qui suit :

DÉFINITIONS

1. Les définitions suivantes s'appliquent à la présente entente :

   a) " Ministre fédéral ". Le ministre d'Environnement Canada ou son mandataire.

   b) " Ministre provincial ". Le ministre de l'Environnement de la Nouvelle-Écosse ou son mandataire.

CANADA/NOVA SCOTIA AGREEMENT RESPECTING AN ACID RAIN REDUCTION PROGRAM

This agreement made on 12, February 1988.

Between: THE GOVERNMENT OF CANADA (herein referred to as "Canada") represented by the Minister of the Environment

AND

THE GOVERNMENT OF THE PROVINCE OF NOVA SCOTIA (herein referred to as the "Province") represented by the Minister of the Environment.

Whereas Canada and Nova Scotia wish to formulate and to cooperate in control measures in Nova Scotia to contribute to the overall reduction of sulphur dioxide, in accordance with the Federal/Provincial Environment Ministers' Agreement of 5 February, 1985, in Montreal, on the apportionment by province of sulphur dioxide emission reductions to decrease acid deposition in Eastern Canada;

Whereas Canada and Nova Scotia are agreed on the objectives, general strategy and procedures to realize this reduction;

Now, therefore, Canada and Nova Scotia hereto mutually agree to the following:

DEFINITIONS

1. The following definitions apply to this Agreement:

   a) "Federal Minister" means the Minister of Environment Canada and includes anyone authorized to act on his behalf.

   b) "Provincial Minister" means the Minister of the Environment of Nova Scotia and includes anyone authorized to act on his behalf.

c) " Dioxyde de soufre ". Le SO_2, un produit gazeux provenant soit de l'oxydation du soufre présent dans les combustibles brûlés ou dans les minerais grillés pour briser la liaison chimique entre les éléments métalliques et le soufre, soit de divers autres procédés chimiques. Ce produit, après libération dans l'atmosphère, peut se transformer en ion sulfate.

d) " Dépôt humide de sulfates ". Le processus par lequel les ions sulfate retombent avec les précipitations : pluie, neige ou brouillard. Ce dépôt est ordinairement mesuré en kilogrammes de sulfates humides par hectare par année.

e) " Oxydes d'azote ". Les NO_x, produits gazeux formés au cours de la combustion des carburants fossiles, ou par un autre procédé chimique. Ils sont surtout constitués de N_2O, de NO et de NO_2.

f) " Objectif ". La quantité maximale (en tonnes) de dioxyde de soufre qu'il est permis d'émettre dans l'atmosphère chaque année.

g) " Secteur industriel ". Groupes d'usines engagées dans des activités essentiellement semblables, par exemple les entreprises papetières.

h) " Autres sources précises ". Sources particulières non industrielles, par exemple le chauffage résidentiel.

i) " Est du Canada ". Toutes les provinces à l'est de la Saskatchewan.

j) " Environnement modérément fragile ". Les eaux douces dans les régions incapables de neutraliser naturellement l'apport acide d'un dépôt humide de sulfates supérieur à 20 kilogrammes par hectare par année.

OBJET DE L'ENTENTE

2. L'objet de la présente entente est de faciliter la collaboration fédérale-provinciale , dans des initiatives de réduction des dépôts humides de sulfates, lesquelles sont fondées

. c) "Sulphur dioxide" means SO_2, a gaseous product of the combustion of sulphur, which is present in fuels being burned or in ores being roasted to liberate the metallic elements from the sulphur or from various other chemical processes, which, after release to the atmosphere, can be transformed to the sulphate ion.

d) "Wet sulphate deposition" means the processes by which sulphate ion is deposited by precipitation: rain, snow or fog. Deposition is usually described in units of kilograms of wet sulphate per hectare per year.

e) "Oxides of nitrogen" means NO_x gaseous products formed during the combustion of fossil fuels, or by other chemical processes, and is mainly composed of N_2O, NO and NO_2.

f) "Emission objective" means the numerical limit of the number of tonnes of sulphur dioxide per annum emitted into the atmosphere which should not be exceeded.

g) "Industrial sectors" means groups of industrial plants engaged in essentially similar business pursuits, e.g., pulp and paper companies.

h) "Other specific source sectors" include groups of individual non-industrial sources, such as residential home heating.

i) "Eastern Canada" includes all the provinces east of the Saskatchewan/Manitoba border.

j) "Moderately sensitive areas" means freshwater aquatic systems in areas without sufficient natural capability to neutralize the acidic input due to wet sulphate deposition rate above 20 kilograms per hectare per year.

PURPOSE OF AGREEMENT

2. The purpose of this Agreement is to facilitate joint federal/ provincial cooperation in initiatives to reduce wet sulphate deposition, using least cost options, to achieve an objective

sur les options les moins onéreuses pour atteindre un objectif maximal de 20 kilogrammes par hectare par année, aux fins de protéger les environnements modérément fragiles de l'est du Canada.

OBJECTIFS

3. Les objectifs de la présente entente sont :

i) d'exposer les mesures et les programmes visant à réduire les émissions totales de dioxyde de soufre de la province à un maximum de deux cent quatre mille (204 000) tonnes par année, avant le 31 décembre 1994;

ii) de favoriser une meilleure compréhension des effets du dépôt humide de sulfates, à l'appui des programmes de réduction;

iii) d'élaborer les programmes de coopération nécessaires à la surveillance des environnements atmosphérique, terrestre et aquatique, en vue d'évaluer les conséquences des réductions effectuées dans les émissions totales de dioxyde de soufre en Nouvelle-Écosse;

iv) de rendre publics ces programmes et ces mesures.

MISE EN OEUVRE

4. Le Canada et la Nouvelle-Écosse ont chacun un rôle à jouer dans la réalisation des objectifs énumérés à l'article 3. À la province, il revient :

i) de négocier des réductions à la source des émissions de dioxyde de soufre en Nouvelle-Écosse, de diffuser de l'information sur les programmes et les mécanismes nécessaires, ainsi que sur l'échéancier établi pour concrétiser ces réductions particulières;

ii) de conseiller le Canada dans ses discussions avec les États-Unis concernant une entente bilatérale sur la réduction des émissions de dioxyde de soufre;

of no more than 20 kilograms per hectare per year to protect the moderately sensitive areas in Eastern Canada.

OBJECTIVES

3. The objectives of this Agreement are:

i) to outline measures and programs to reduce the Province's total sulphur dioxide emissions to an emission target of no more than two hundred and four thousand (204,000) tonnes per year before 31 December, 1994;

ii) to foster a further understanding of the impacts of wet sulphate deposition in support of control programs;

iii) to develop cooperative programs required to monitor the atmospheric, terrestrial and aquatic environments in order to assess the consequences of reductions in Nova Scotia's total sulphur dioxide emissions;

iv) to make public these measures and programs.

UNDERTAKING

4. Both Canada and Nova Scotia have roles in achieving the objectives listed in Section 3; in order to assist in meeting the objectives, the Province shall:

i) negotiate reductions in sulphur dioxide emissions at the appropriate sources within Nova Scotia and make public information on the programs and mechanisms to achieve these reductions as well as a timetable for specific reductions;

ii) offer advice to Canada in its discussions with the United States regarding a bilateral agreement on sulphur dioxide emissions reductions;

iii) de collaborer avec le Canada, dans la mesure du possible, à la réalisation des programmes nécessaires de recherche et de surveillance;

iv) d'établir et de tenir à jour, de concert avec le Canada, un inventaire des émissions de dioxyde de soufre.

5. Au Canada, il revient:

i) de négocier des ententes avec les autres provinces de l'est du Canada, afin qu'au 31 décembre 1994 les émissions totales de SO_2 dans l'est du Canada ne dépassent pas 2,3 millions de tonnes par année, aux fins de protéger les environnements modérément fragiles;

ii) de poursuivre les négociations avec les États-Unis, par le truchement des Affaires extérieures, afin d'obtenir de ce pays des réductions compatibles;

iii) d'appuyer la poursuite des recherches sur la mise au point et le perfectionnement des technologies touchant la combustion et l'épuration du charbon de la Nouvelle-Écosse;

iv) de poursuivre les recherches sur la modélisation, la mesure et les effets des dépôts menées au sein des ministères de l'Environnement, des Forêts, de l'Agriculture, des Pêches et des Océans et de la Santé et du Bien-être social; et d'en communiquer régulièrement les résultats par le truchement du Comité de coordination de la recherche et de la surveillance, du Comité directeur fédéral-provincial du TADPA et du Comité consultatif fédéral-provincial de la qualité de l'air;

v) d'étudier les répercussions de nouvelles normes sur les oxydes d'azote dégagés par les véhicules à moteur;

vi) d'examiner la possibilité de réduire les émissions de SO_2 par l'adoption de combustibles autres que le mazout lourd, d'en déterminer les répercussions dans l'est du Canada, et de présenter un rapport sur le sujet;

iii) cooperate with Canada, where feasible, in necessary research and monitoring programs;

iv) maintain and update, in cooperation with Canada, a sulphur dioxide emission inventory.

5. In order to assist in meeting the objectives, Canada shall:

i) negotiate agreements with the remaining eastern Canadian provinces to ensure that the overall total SO_2 emissions in Eastern Canada do not exceed 2.3 million tonnes per year by 31 December, 1994, in order to protect moderately sensitive areas;

ii) pursue negotiations via the Department of External Affairs with the United States to secure compatible reductions in the United States;

iii) support the continued research and refinement of new technologies for combustion and cleaning of Nova Scotia coal;

iv) continue research on deposition modelling, measurement and impacts through the Departments of Environment, Forestry, Agriculture, Fisheries and Oceans, and Health and Welfare; and report findings on a regular basis via the Research and Monitoring Coordinating Committee, the Federal/Provincial LRTAP Steering Committee, and the Federal/Provincial Advisory Committee on Air Quality;

v) investigate the impact of further regulation of motor vehicles with respect to the emission of oxides of nitrogen;

vi) investigate and report on the feasibility of reducing SO_2 emissions via fuel switching opportunities for heavy fuel oil users and its impact in Eastern Canada;

vii) d'entreprendre, sous réserve d'un accord mutuel, des programmes visant à maîtriser les polluants à l'origine des pluies acides;

viii) de consulter la province lorsque des politiques fédérales nuiront à la çapacité de la Nouvelle-Écosse de satisfaire aux objectifs de réduction des émissions de dioxyde de soufre;

ix) de s'assurer que toutes les sources appartenant au gouvernement fédéral ont recours aux moyens appropriés pour réduire au minimum leurs émissions de dioxyde de soufre.

ÉVALUATION

6. i) Au plus tard le 31 mars de chaque année, la Nouvelle-Écosse publiera un rapport décrivant les mesures et les programmes mis en oeuvre durant l'année civile précédente. Ce rapport contiendra des renseignements indiquant si la réduction des émissions est effectuée de façon conforme à l'échéancier fixé pour la réalisation de l'objectif global. Dans la négative, la province déterminera la ligne de conduite à suivre.

ii) Au plus tard le 31 juillet de chaque année, le Canada communiquera au ministre provincial un rapport d'étape sommaire pour toutes les provinces de l'est.

iii) Au plus tard le 31 mars de chaque année, le Canada communiquera les conclusions de ses recherches, ses données et un aperçu de la situation des pluies acides au Canada et à l'échelle internationale.

COORDINATION

7. i) Le ministre fédéral et le ministre provincial ou leurs mandataires se rencontreront au moins une fois par année, sauf si les parties en décident autrement, pour passer en revue la mise en oeuvre générale de l'entente et les progrès réalisés.

vii) undertake, where it is mutually agreed, programs to control pollutants which cause acid rain;

viii) consult with the Province when federal policies will adversely effect the ability of Nova Scotia to meet sulphur dioxide emission reduction objectives;

ix) ensure that all federally owned sources utilize appropriate means in order to minimize sulphur dioxide emissions.

EVALUATION

6. i) On or before 31 March of each year, Nova Scotia shall make available a report describing the implemented measures and programs of the previous calendar year. This report will provide information on whether the reduction of the emissions is proceeding in accordance with the timetable set out for the purpose of achieving the overall goal. If it is not, the course of action to be taken will be outlined by the Province.

ii) On or before 31 July of each year, Canada shall make a summary progress report for all the Eastern Provinces available to the Provincial Minister.

iii) On or before 31 March of each year, Canada shall make available its research findings, its data and an overview of the Canadian and international situation relating to acid rain.

COORDINATION

7. i) The Federal Minister and the Provincial Minister or their representatives shall meet at least once annually, unless otherwise mutually agreeable, to review the general operation and progress under this Agreement.

ii) Il sera formé un groupe de travail composé de fonctionnaires provinciaux et régionaux, qui se consulteront de façon suivie et surveilleront la mise en oeuvre de l'entente.

ii) A working group will be formed of provincial and regional officials to consult on an ongoing basis and monitor the progress of the Agreement.

DURÉE

8. La présente entente prendra fin le 31 décembre 1994. Une nouvelle entente pourra s'avérer nécessaire au sujet des niveaux d'émissions après 1994.

DURATION

8. Expiry date of this Agreement is 31 December, 1994. A new Agreement may be required to address post 1994 emission levels.

En foi de quoi, la présente entente a été signée, au nom du Canada, par le ministre de l'Environnement et, au nom de la province, par le ministre de l'Environnement.

In witness, whereof, this Agreement has been executed on behalf of Canada by the Minister of the Environment and on behalf of the Province by the Minister of the Environment.

GOUVERNEMENT DU CANADA

Ministre de l'Environnement

Témoin

GOVERNMENT OF CANADA

Minister of the Environment

Witness

GOUVERNEMENT DE LA NOUVELLE-ÉCOSSE

Ministre de l'Environnement

Témoin

GOVERNMENT OF THE PROVINCE OF NOVA SCOTIA

Minister of the Environment

Witness

The Ministers of the Environment of Canada, Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia, and Newfoundland have reached the following agreement.

The federal Minister of Environment and the Ministers of Environment of Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia and Newfoundland* are committed, using least cost options, to achieving a wet sulphate deposition of no more than 20 kilograms per hectare per year to protect the environment in moderately sensitive areas in eastern Canada by reducing total sulphur dioxide emissions east of the Saskatchewan/Manitoba border and by securing compatible emission reductions in the United States as soon as possible.

The federal and provincial governments agree to support financially the abatement efforts needed to meet the emission reductions incorporated in the following emission objectives in accordance with the needs identified by the parties.

Consequently, the provincial Environment Ministers agree to the following reductions in SO_2 emissions toward achieving the 1994 objectives:

Province	1980 Base Case (tonnes)	Reductions (tonnes)	Emission Object (tonnes)
Manitoba	738,000	188,000	550,000
Ontario	2,194,000	1,164,000	1,030,000
Quebec	1,085,000	485,000	600,00
New Brunswick	215,00	30,000	185,000
Prince Edward Island	6,000	1,000	5,000
Nova Scotia	219,000	15,000	204,000
Newfoundland	59,000	14,000	45,000
TOTAL:	4,516,000	1,897,000	2,619,000

Recognizing the overall goal is to achieve a deposition level not greater than 20 kilograms per hectare per year and an eastern Canadian emission level of 2.3 million tonnes (50% of 1980 Base Case), the federal and provincial Ministers are committed to pursuing further reductions in sufficient time to achieve this overall goal by 1994.

Ministers have undertaken to review progress on an annual basis.

With reference to the smelting industry, ministers agree that primary responsibility for financing abatement measures rests with the industry. Should government assistance be deemed necessary, the federal government will assume the lead role in arranging the necessary financial support and negotiating agreements, in conjunction with provincial governments, required for modernization, technology development and the installation of abatement equipment in order to meet the emission objectives established by the provinces. The governments concerned agree to undertake the necessary measures to conclude the agreements as soon as possible.

The provincial Ministers agree to use their authorities to achieve these emission levels which include those already announced by Ontario, Quebec, and New Brunswick to take effect by 1990. organized labour and affected communities will be consulted. In consultation with the provincial Ministers, the federal Minister agrees to use federal authorities in a complementary manner in matters under federal jurisdiction.

*Prince Edward Island supports this position.

Montreal 05.02.85

Appendix 2

Reports from Nova Scotia Department of the Environment concerning Acid Rain and Air Pollution.

Acidification of Nova Scotia lakes. I. Response of diatom assemblages in the Halifax area. H.H. Vaughan, J.K. Underwood, and J.G. Ogden III. Water, Air and Soil Pollution (1982). 18:353-361.

Acidification of Nova Scotia lakes. III. Atmospheric deposition of SO_4, and NO_3 and effects on rural and urban lakes. 1985. J.K. Underwood, J.G. Ogden III, J.J. Kerekes, and H.H. Vaughan. Water, Air and Soil Pollution, Vol. 32, (1987) 77-87.

Fish species distribution and water chemistry in Nova Scotian lakes (with D.L. Smith, J.G. Ogden III and B.C. Sabean). Water, Air and Soil Pollution 30 (1986): 489-496.

Contemporary chemistry of Nova Scotia lakes (with J.G. Ogden III, and D.L. Smith). Water, Air and Soil Pollution 30 (1986): 991-999.

Natural and anthropogenic causes of lake acidification in Nova Scotia. E. Gorham, J.K. Underwood, F.B. Martin, and J.G. Ogden III. Nature 324 (6096): 451-452 (December 4, 1986).

Acidic precipitation in Nova Scotia. J.K. Underwood. April 1, 1981. Nova Scotia Department of the Environment Technical Report. 24 p.

Acidification of Nova Scotia lakes. II. Ionic balances in dilute waters. J.K. Underwood, H.H. Vaughan, C.G. Mann, and J.G. Ogden III. February 1982. Presented at annual meeting AMS/CMOS, Albany NY, April 1981. 32 p.

Monitoring acid precipitation. J.K. Underwood. 1981. Presented to the Annual Technical Meeting, Atlantic Canada Chapter, Air Pollution Control Association. October 1981. 29 p.

Acidic lakes. In Nova Scotia: Estimates of numbers and areas. J.K. Underwood and P.Y. Schwartz. NSDOE Technical Report 1987. 15 p.

Precipitation chemistry in Nova Scotia: 1978-1987. J.K. Underwood, D.H. Waller and J.G. Ogden III. October 1988. Submitted for publication.